

CLAIMS

We claim:

1. A method of forming a metallic feature on a substrate, comprising the
5 steps of:

providing a stamp having a raised region;

depositing catalytic particles on a selected area of the stamp, including
the raised region thereof;

providing a substrate;

- 10 applying the stamp to the substrate, such that the raised region of the
stamp causes a corresponding indented region in the substrate and at least some
of the catalytic particles are transferred to a selected area of the substrate; and
plating the selected area of the substrate.

- 15 2. A method according to claim 1, wherein the step of depositing catalytic
particles on the selected area of the stamp comprises the step of immersing at
least the selected area of the stamp in a suspension comprising the catalytic
particles.

- 20 3. A method according to claim 2, wherein the step of immersing at least
the selected area of the stamp in a suspension comprising the catalytic particles
comprises the step of immersing at least the selected area of the stamp in an
aqueous suspension comprising the catalytic particles.

- 25 4. A method according to claim 2, further comprising the step of drying at
least the selected area of the stamp, after immersion thereof in the suspension.

5. A method according to claim 4, wherein the step of drying at least the selected area of the stamp comprises the step of blow drying at least the selected area of the stamp with a gas.

5 6. A method according to claim 5, wherein the step of blow drying at least the selected area with a gas comprises the step of blow drying the selected area with nitrogen, helium or air.

10 7. A method according to claim 4, wherein the step of depositing catalytic particles on the selected area of the stamp comprises the step of depositing polymer-stabilised catalytic particles on the selected area of the stamp.

15 8. A method according to claim 7, wherein the step of depositing polymer-stabilised catalytic particles on the selected area of the stamp comprises the step of depositing catalytic particles stabilised by polyvinylpyrrolidone, poly-2-vinylpyridine or polyvinyl alcohol on the selected area of the stamp

20 9. A method according to claim 1, wherein the step of depositing catalytic particles on the selected area of the stamp comprises the step of depositing palladium-based catalytic particles on the selected area of the stamp.

25 10. A method according to claim 9, wherein the step of depositing catalytic particles on the selected area of the stamp comprises the step of depositing polymer-stabilised catalytic particles on the selected area of the stamp.

11. A method according to claim 10, wherein the step of depositing polymer-stabilised catalytic particles on the selected area of the stamp comprises the step of depositing catalytic particles stabilised by

polyvinylpyrrolidone, poly-2-vinylpyridine or polyvinyl alcohol on the selected area of the stamp

12. A method according to claim 1, wherein the step of providing a substrate
5 comprises the step of providing a polymeric substrate.

13. A method according to claim 12, wherein the step of depositing catalytic
particles on the selected area of the stamp comprises the step of immersing at
least the selected area of the stamp in a suspension comprising the catalytic
10 particles.

14. A method according to claim 13, further comprising the step of drying at
least the selected area of the stamp, after immersion thereof in the suspension.

15. A method according to claim 12, wherein the step of providing a
polymeric substrate comprises the step of providing a substrate formed from a
polystyrene, a polyimide, an acrylic or an epoxy.

16. A method according to claim 1, wherein the step of applying the stamp
20 to the substrate further comprises the step of heating at least one of the stamp or
the substrate.

17. A method according to claim 16, wherein the step of heating at least one
of the stamp or the substrate comprises the step of heating one of the stamp or
25 the substrate to around or above the glass transition temperature of the
substrate.

18. A method according to claim 1, further comprising the step of modifying at least the selected area of the substrate to facilitate the deposition of the catalytic particles thereon.

5 19. A method according to claim 18, wherein the step of modifying at least the selected area of the substrate comprises the step of chemically modifying the selected area of the substrate.

10 20. A method according to claim 1, further comprising the step of removing some of the catalytic particles from the stamp.

15 21. A method according to claim 20, wherein the step of removing some of the catalytic particles from the stamp comprises the steps of: applying an adhesive surface to the stamp; and subsequently removing the adhesive surface from the stamp.

22. A method of forming a metallic feature on a substrate, comprising the steps of:

20 providing a mould, an inner surface thereof having a raised region, depositing catalytic particles on a selected area of the inner surface of the mould, including the raised region thereof;

providing a substrate material;

25 moulding the substrate material within the mould, such that a resulting substrate has an indented region corresponding to the raised region of the inner surface of the mould and at least some of the catalytic particles are transferred to a selected area of the substrate; and

plating the selected area of the substrate.

23. A method according to claim 22, wherein the step of depositing catalytic particles on the selected area of the inner surface of the mould comprises the step of immersing at least the selected area of the inner surface of the mould in a suspension comprising the catalytic particles.

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24. A method according to claim 23, wherein the step of immersing at least the selected area of the inner surface of the mould in a suspension comprising the catalytic particles comprises the step of immersing at least the selected area of the inner surface of the mould in an aqueous suspension comprising the catalytic particles.

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25. A method according to claim 23, further comprising the step of drying at least the selected area of the mould, after immersion thereof in the suspension.

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26. A method according to claim 25, wherein the step of drying at least the selected area of the mould comprises the step of blow drying at least the selected area of the mould with a gas.

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27. A method according to claim 26, wherein the step of blow drying the selected area with a gas comprises the step of blow drying the selected area with nitrogen, helium or air.

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28. A method according to claim 25, wherein the step of depositing catalytic particles on the selected area of the inner surface of the mould comprises the step of depositing polymer-stabilised catalytic particles on the selected area of the inner surface of the mould.

29. A method according to claim 28, wherein the step of depositing polymer-stabilised catalytic particles on the selected area of the inner surface of

the mould comprises the step of depositing catalytic particles stabilised by polyvinylpyrrolidone, poly-2-vinylpyridine or polyvinyl alcohol on the selected area of the inner surface of the mould.

5 30. A method according to claim 22, wherein the step of depositing catalytic particles on the selected area of the inner surface of the mould comprises the step of depositing palladium-based catalytic particles on the inner surface of the mould.

10 31. A method according to claim 30, wherein the step of depositing catalytic particles on the selected area of the inner surface of the mould comprises the step of depositing polymer-stabilised catalytic particles on the selected area of the inner surface of the mould.

15 32. A method according to claim 31, wherein the step of depositing polymer-stabilised catalytic particles on the selected area of the inner surface of the mould comprises the step of depositing catalytic particles stabilised by polyvinylpyrrolidone, poly-2-vinylpyridine or polyvinyl alcohol on the selected area of the inner surface of the mould.

20 33. A method according to claim 22, wherein the step of providing a substrate material comprises the step of providing a polymeric substrate material.

25 34. A method according to claim 33, wherein the step of depositing catalytic particles on the selected area of the inner surface of the mould comprises the step of immersing at least the selected area of the inner surface of the mould in a suspension comprising the catalytic particles.

35. A method according to claim 34, further comprising the step of drying at least the selected area of the mould, after immersion thereof in the suspension.

5 36. A method according to claim 33, wherein the step of providing a polymeric substrate material comprises the step of providing a thermoset substrate material, and wherein the step of moulding the substrate material comprises the steps of: moulding the substrate material in an uncured or partially cured state; and curing the substrate material in the mould.

10 37. A method according to claim 33, wherein the step of providing a polymeric substrate material comprises the step of providing a thermoplastic substrate material, and wherein the step of moulding the substrate material comprises the step of heating the substrate material to around or above the glass transition temperature thereof.

15 38. A method according to claim 33, wherein the step of providing a polymeric substrate material comprises the step of providing a substrate formed from a polystyrene, a polyimide, an acrylic or an epoxy.

20 39. A method according to claim 38, wherein the step of providing a polymeric substrate material comprises the step of providing a thermoset substrate material, and wherein the step of moulding the substrate material comprises the steps of: moulding the substrate material in an uncured or partially cured state; and curing the substrate material in the mould.

25 40. A method according to claim 38, wherein the step of providing a polymeric substrate material comprises the step of providing a thermoplastic substrate material, and wherein the step of moulding the substrate material

comprises the step of heating the substrate material to around or above the glass transition temperature thereof.

41. A method according to claim 22, further comprising the step of
5 removing some of the catalytic particles from the inner surface of the mould.

42. A method according to claim 41, wherein the step of removing some of
the catalytic particles from the inner surface of the mould comprises the steps
of: applying an adhesive surface to the inner surface of the mould, and
10 subsequently removing the adhesive surface from the inner surface of the
mould.

43. A method of forming a metallic feature on a substrate, comprising the
steps of:
15 providing a stamp;
depositing polymer-stabilised catalytic particles on a selected area of the
stamp;
providing a substrate;
applying the stamp to the substrate such that at least some of the
20 polymer-stabilised catalytic particles are transferred to a selected area of the
substrate; and
plating the selected area of the substrate.

44. A method according to claim 43, wherein the step of depositing
25 polymer-stabilised catalytic particles on the selected area of the stamp
comprises the step of depositing catalytic particles stabilised by
polyvinylpyrrolidone, poly-2-vinylpyridine or polyvinyl alcohol on the selected
area of the stamp.

45. A method according to claim 43, wherein the step of depositing polymer-stabilised catalytic particles on the selected area of the stamp comprises the step of depositing palladium-based polymer-stabilised catalytic particles on the selected area of the stamp.

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46. A method according to claim 43, wherein the selected area of the stamp comprises a raised region of the stamp.

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47. A method according to claim 46, wherein the step of applying the stamp to the substrate comprises the step of pressing the stamp and the substrate against one another such that the raised region of the stamp causes a corresponding indented region in the substrate.

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48. A method according to claim 43, wherein the step of depositing polymer-stabilised catalytic particles on the selected area of the stamp comprises the step of immersing at least the selected area of the stamp in a suspension comprising the polymer-stabilised catalytic particles.

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49. A method according to claim 48, wherein the step of immersing at least the selected area of the stamp in a suspension comprising the polymer-stabilised catalytic particles comprises the step of immersing at least the selected area of the stamp in an aqueous suspension comprising the polymer-stabilised catalytic particles.

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50. A method according to claim 48, further comprising the step of drying at least the selected area of the stamp, after immersion thereof in the suspension.

51. A method according to claim 50, wherein the step of drying at least the selected area of the stamp comprises the step of blow drying at least the selected area of the stamp with a gas.

5 52. A method according to claim 51, wherein the step of blow drying at least the selected area of the stamp with a gas comprises the step of blow drying the selected area with nitrogen, helium or air.

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10 53. A method according to claim 43, wherein the step of providing a substrate comprises the step of providing a polymeric substrate.

15 54. A method according to claim 53, wherein the step of depositing polymer-stabilised catalytic particles on the selected area of the stamp comprises the step of immersing at least the selected area of the stamp in a suspension comprising the polymer-stabilised catalytic particles.

55. A method according to claim 54, further comprising the step of drying at least the selected area of the stamp, after immersion thereof in the suspension.

20 56. A method according to claim 53, wherein the step of providing a polymeric substrate comprises the step of providing a substrate formed from a polystyrene, a polyimide, an acrylic or an epoxy.

25 57. A method according to claim 43, wherein the step of applying the stamp to the substrate further comprises the step of heating at least one of the stamp or the substrate.

58. A method according to claim 57, wherein the step of heating at least one of the stamp or the substrate comprises the step of heating at least one of the

stamp or the substrate to around or above the glass transition temperature of the substrate.

59. A method according to claim 43, further comprising the step of
5 modifying at least the selected area of the substrate to facilitate the position of the polymer-stabilised catalytic particles thereon.

60. A method according to claim 59, wherein the step of modifying at least
10 the selected area of the substrate comprises the step of chemically modifying at least the selected area of the substrate.

61. A method according to claim 43, further comprising the step of
15 removing some of the polymer-stabilised catalytic particles from the stamp prior to the application thereof to the substrate.

62. A method according to claim 61, wherein the step of removing some of
the polymer-stabilised catalytic particles from the stamp comprises the steps of:
applying an adhesive surface to the stamp; and subsequently removing the
adhesive surface from the stamp.

63. A method according to claim 62, wherein the step of applying an
20 adhesive surface to the stamp comprises the step of applying a patterned adhesive surface to the stamp.

64. A stamp for application to a substrate, having a selected area comprising
25 a raised region on a surface thereof and at least the selected area of the surface having catalytic particles deposited thereon.

65. A stamp according to claim 64, wherein the catalytic particles are polymer-stabilised catalytic particles.

66. A stamp for application to a substrate, comprising polymer-stabilised catalytic particles deposited on a selected area of a surface thereof.

67. A stamp according to claim 66, wherein the selected area of the surface of the stamp comprises at least one raised region.

68. An apparatus for preparing a substrate, comprising:
a stamp having a selected area comprising a raised region on a surface thereof and at least the selected area of the surface having catalytic particles deposited thereon; and
means to apply the stamp to a substrate.

69. An apparatus according to claim 68, further comprising means to plate the substrate.

70. An apparatus according to claim 69, wherein the means to plate the substrate comprise means to electroless plate or immersion plate the substrate.

71. An apparatus according to claim 68, further comprising means to selectively remove some of the catalytic particles from the stamp.

72. An apparatus according to claim 71, further comprising means to plate the substrate.

73. An apparatus according to claim 72, wherein the means to plate the substrate comprise means to electroless plate or immersion plate the substrate.

74. An apparatus for preparing a substrate, comprising:
a stamp comprising polymer-stabilised catalytic particles deposited on a
selected area of a surface thereof; and
5 means to apply the stamp to a substrate.

75. An apparatus according to claim 74, further comprising means to plate
the substrate.

10 76. An apparatus according to claim 75, wherein the means to plate the
substrate comprise means to electroless plate or immersion plate the substrate.

77. An apparatus according to claim 74, further comprising means to
selectively remove some of the catalytic particles from the stamp.

15 78. An apparatus according to claim 77, further comprising means to plate
the substrate.

20 79. An apparatus according to claim 78, wherein the means to plate the
substrate comprise means to electroless plate or immersion plate the substrate.